



Illinois Department of Transportation

To: John Fortman Attn: District One
From: John D. Baranzelli
Subject: Pavement Design
Date: November 8, 2012

A handwritten signature, likely of John D. Baranzelli, written in black ink.

FAI Route 94 (I-94)
Cook County
At Des Plaines River

We have reviewed the pavement design for the project, which was submitted to BDE by email dated October 23, 2012. The Life Cycle Cost Analysis favors the rigid pavement design by more than 10%.

The approved pavement design is as follows:

Rand Road over Des Plaines River (Pavement Reconstruction)

9 inches of Jointed PCC Pavement with Tied PCC Curb & Gutter
12 inches of Aggregate Subgrade Improvement

Wilson Lane (Pavement Reconstruction)(Local Jurisdiction)

7 inches of Full Depth HMA Pavement with Tied PCC Curb & Gutter
2 inches of HMA Surface Course, Mix "D", N70
5 inches of HMA Binder Course, IL-19.0, N70
12 inches of Aggregate Subgrade Improvement

If you have any questions, please contact Paul Niedernhofer at (217) 524-1651.



Illinois Department of Transportation

Memorandum

To: John D. Baranzelli

Attn: Paul Niedernhofer

From: John Fortmann

By: Jose Dominguez

Subject: Pavement Analysis*

Date: October 23, 2012

*Route: Rand Road
Limits: At Des Plaines River
Section: 120-Y-B
County: Cook

Contract No.: 60J10
Job No.: P-91-429-09
Current target: 08CY14

We have completed the pavement analysis for the above captioned location. Review by the Central Office is required since the total pavement area for reconstruction exceeds 4,750 Square Yards. The following is the scope of the project:

- a) Pavement reconstruction of approximately 1884 feet of Rand Road from Elk Road to Ballard Road to accommodate the improved 5-lane section.
- b) Pavement reconstruction of approximately 380 feet of Wilson Lane to accommodate the re-alignment.

A 20 year pavement analysis was performed on the above segments. We recommend a mechanistic-rigid pavement design for Rand Road based on the life cycle cost analysis which favors PCC pavement by over 13%.

Rand Road over Des Plaines River

PCC curb and gutter (tied)
Pavement Reconstruction
9" PCC Pavement (Jointed)¹
12" Aggregate Subgrade Improvement²

A segmental pavement analysis was performed on Wilson Lane and it is recommended to match-in-kind to existing pavement and use a flexible pavement design. Our recommendation is as follows:

Wilson Lane⁴

PCC curb and gutter (untied)
Pavement reconstruction
7" Full Depth Hot-Mix Asphalt Pavement³
2" Hot-Mix-Asphalt Surface Course, Mix "D", N50
5" Hot-Mix-Asphalt Binder Course, IL-19.0, N50
12" Aggregate Subgrade Improvement²

Pete Harmet
October 23, 2012
Page Two


¹Designer Note 1: Use pay item #42000401, "**PORTLAND CEMENT CONCRETE PAVEMENT, 9" (JOINTED)**", paid in square yards. Transverse contraction joints should be reduced to a maximum of 14 foot spacing for 9" PCC pavement.

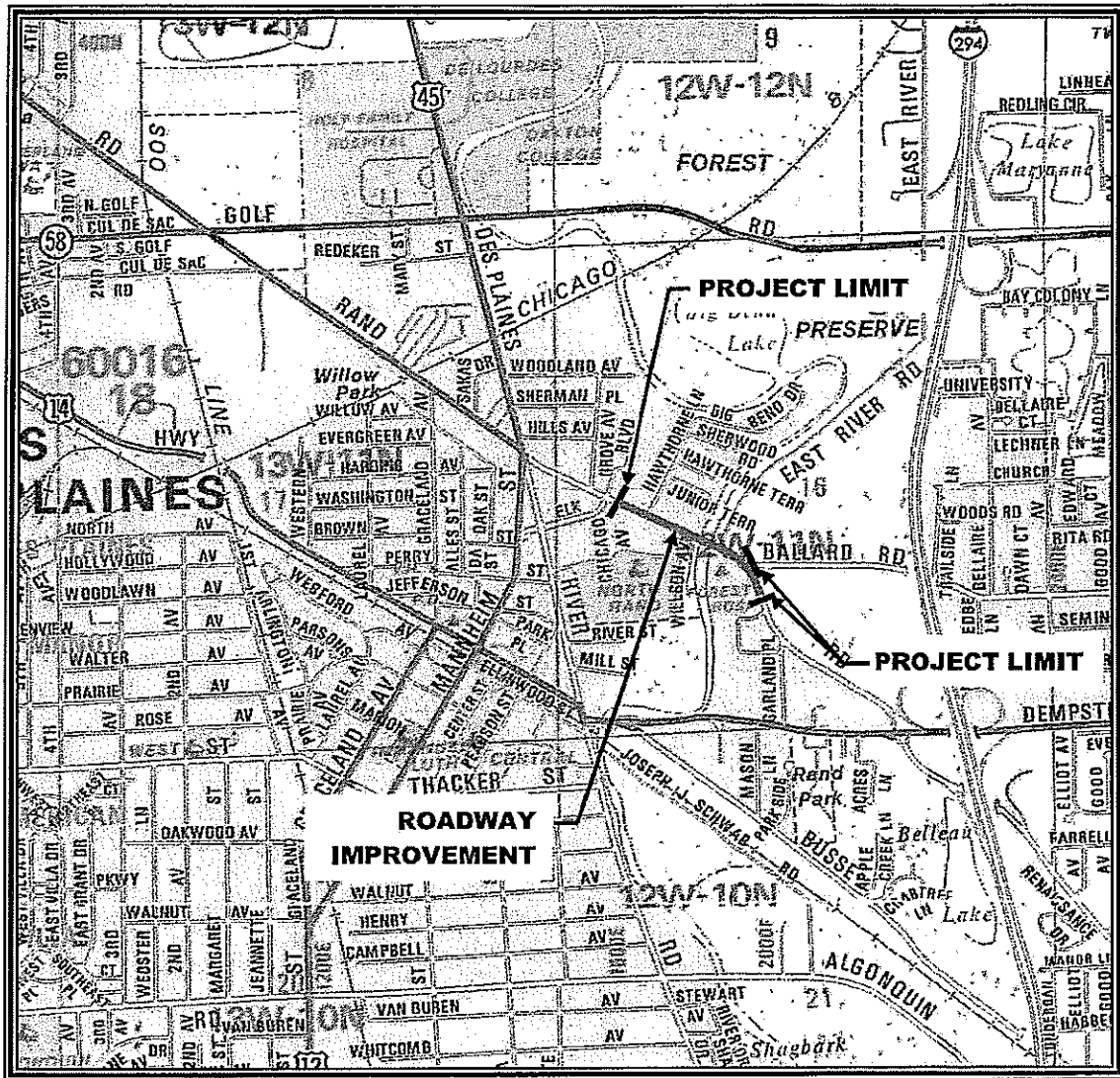
²Designer Note 2: Use pay item #30300112, "**AGGREGATE SUBGRADE IMPROVEMENT, 12"**" paid for in square yards.

³Designer Note 3: Use pay item # 40701821, "**HOT-MIX ASPHALT (FULL-DEPTH), 7"**", paid in square yards.

⁴Designer note 4: Wilson Lane is subject to local jurisdictional approval and concurrence.

If you have any questions or need additional information, please contact Jenpai Chang, Interim Pavement Engineer, at (847) 705-4432.

By: 
Jose A. Dominguez, P.E.
Project Support Engineer



N



Location Map

Proposed Improvement

Rand Road over Des Plaines River

Municipality: Des Plaines
County: Cook
Route: FAU 3523
Project No.: P- 91-429-09
Structure No.: 016-0362

Figure 1

PROJECT AND TRAFFIC INPUTS

(Enter Data in Gray Shaded Cells)

Route: **Rand Rd (FAU 3523)**Section: **120-Y-B**County: **Cook**Location: **Elk Blvd to Ballard Rd**Comments: **Rand Road Reconstruction****Over Des Plaines Rd**

Design Date:

Modify Date:

<-- BY

<-- BY

ADT

Year

Current:

27,400

2010

Future:

29,400

2030

Facility Type: **Other Marked State Route**

of Lanes =

4

Road Class:

I

Subgrade Support Rating (SSR): **Poor**Construction Year: **2013**Design Period (DP) = **20** years

Structural Design Traffic

	Minimum ADT	Actual ADT	Actual % of Total ADT	% of ADT in Design Lane
PV =	0	28,043	97.7%	P = 32%
SU =	250	519	1.8%	S = 45%
MU =	750	138	0.5%	M = 45%
Struct. Design ADT =	28,700		(2023)	

TRAFFIC FACTOR CALCULATION

FLEXIBLE PAVEMENT

Cpv = 0.15

Csu = **132.5**Cmu = **482.53**

TF flexible (Actual) = 1.24 (Actual ADT)

TF flexible (Min) = 3.56 (Min ADT Fig. 54-2.C)

RIGID PAVEMENT

Cpv = 0.15

Csu = **143.81**Cmu = **696.42**

TF rigid (Actual) = 1.56 (Actual ADT)

TF rigid (Min) = 5.02 (Min ADT Fig. 54-2.C)

NEW CONSTRUCTION / RECONSTRUCTION PAVEMENT DESIGN CALCULATIONS

Full-Depth HMA Pavement

Use TF flexible = 3.56

PG Grade Lower Binder Lifts = **PG 64-22** (Fig. 53-4.R)HMA Mixture Temp. = **74.0** deg. F (Fig. 54-5.C)Design HMA Mixture Modulus (E_{HMA}) = 720 ksi (Fig. 54-5.D)Design HMA Strain (ϵ_{HMA}) = 84 (Fig. 54-5.E)

Full Depth HMA Design Thickness = 10.00 in. (Fig. 54-5.F)

Limiting Strain Criterion Thickness = **14.50** in. (Fig. 54-5.I)

Use Full-Depth HMA Thickness = 10.00 inches

JPC Pavement

Use TF rigid = 5.02

Edge Support = **Tied** Shoulder or C.&G.Rigid Pavt Thick. = **9.00** in. (Fig. 54-4.E)

CRC Pavement

Use TF rigid = 5.02

IBR value = **3**CRCP Thickness = **8.00** in. (Fig. 54-4.M)

TF MUST BE > 60 FOR CRCP

RECONSTRUCTION ONLY (SUPPLEMENTAL) PAVEMENT DESIGN CALCULATIONS

HMA Overlay of Rubblized PCC

Use TF flexible = 3.56

District = **3,4,5,6**

HMA Overlay Design Thickness = 8.00 in. (Fig. 54-5.U)

Unbonded Concrete Overlay

Review 54-4.03 for limitations and special considerations.

JPCP Thickness = **NA** inches

CONTACT BMPR FOR ASSISTANCE

DESIGN TABLES FROM BDE MANUAL CHAPTER 54 - PAVEMENT DESIGN

Class I Roads	Class II Roads	Class III Roads	Class IV Roads
4 lanes or more	2 lanes with ADT > 2000	2 Lanes	2 Lanes
Part of a future 4 lanes or more	One way Street with ADT <= 3500	(ADT 750 -2000)	(ADT < 750)
One-way Streets with ADT > 3500			

	Min. Str. Design Traffic (Fig 54-2.C)		
Facility Type	PV	SU	MU
Interstate or Supplemental Freeway	0	500	1500
Other Marked State Route	0	250	750
Unmarked State Route	No Min	No Min	No Min

Class Table for One-Way Streets	
ADT	Class
0 - 3500	II
>3501	I

	Traffic Factor ESAL Coefficients			
	Rigid (Fig. 54-4.C)		Flexible (Fig. 54-5.B)	
Class	Csu	Cmu	Csu	Cmu
I	143.81	696.42	132.50	482.53
II	135.78	567.21	112.06	385.44
III	129.58	562.47	109.14	384.35
IV	129.58	562.47	109.14	384.35

Class Table for 2 or 3 lanes (not future 4 lane & not one-way street)	
ADT	Class
0 - 749	IV
750 - 2000	III
>2000	II

	Design Lane Distribution Factors For Structural Design Traffic (Fig. 54-2.B)					
	Rural			Urban		
Number of Lanes	P	S	M	P	S	M
1 Lane Ramp	100%	100%	100%	100%	100%	100%
2 or 3	50%	50%	50%	50%	50%	50%
4	32%	45%	45%	32%	45%	45%
6 or more	20%	40%	40%	8%	37%	37%

LIFE-CYCLE COST ANALYSIS: NEW CONSTRUCTION / RECONSTRUCTION**FULL-DEPTH HMA PAVEMENT**

Standard Design

ROUTE
SECTION
COUNTY
LOCATION

Rand Rd (FAU 3523)
120-Y-B
Cook
Elk Blvd to Ballard Rd

FACILITY TYPE

NON-INTERSTATE

PROJECT LENGTH 1884 FT ==> 0.36 Miles
OF CENTERLINES 3 CL
OF LANES 4 LANES
OF EDGES 2 EP
LANE WIDTH - AVERAGE 12 FT
SHOULDER WIDTH HMA Inside 0 FT
HMA Outside 0 FT

PAVEMENT THICKNESS (FLEXIBLE) 10.00 IN 14.50 IN MAX
SHOULDER THICKNESS 8.00 IN
POLYMER OVERLAY THICKNESS 2.25 IN

FLEX PAVEMENT	TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
		3.56	1.24	3.56

Read Me!

HMA	COST PER TON	UNIT PRICE
HMA SURFACE		\$95.00 / TON
HMA TOP BINDER		\$90.00 / TON
HMA LOWER BINDER		\$85.00 / TON
HMA BINDER (LEVELING)		\$95.00 / TON
HMA SHOULDER		\$85.00 / TON

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT	UNIT PRICE	COST
HMA PAVEMENT (FULL-DEPTH)	(10.00")	10,048	SQ YD	\$42.54 / SQ YD	\$427,442 ~
HMA SURFACE COURSE	(2.00")	10,048	SQ YD	\$8.98 / SQ YD	\$0
HMA TOP BINDER COURSE	(2.25")	10,048	SQ YD	\$10.12 / SQ YD	\$0
HMA LOWER BINDER COURSE	(5.75")	10,048	SQ YD	\$23.44 / SQ YD	\$0
HMA SHOULDER	(8.00")	0	TONS	\$85.00 / TON	\$0 ~
CURB & GUTTER		0	LIN FT	\$30.00 / LIN FT	\$0
SUBBASE GRAN MATL TY C (TONS)		20	TONS	\$25.00 / TON	\$500
IMPROVED SUBGRADE:	Aggregate	10,606	SQ YD	\$10.00 / SQ YD	\$106,060
Reserved For User Supplied Item		0	UNITS	\$0.00 / UNITS	\$0
Reserved For User Supplied Item		0	UNITS	\$0.00 / UNITS	\$0
PAVEMENT REMOVAL		10,048	SQ YD	\$0.00 / SQ YD	\$0
SHOULDER REMOVAL		0	SQ YD	\$0.00 / SQ YD	\$0

Note: * Denotes User Supplied Quantity

FLEXIBLE CONSTRUCTION INITIAL COST \$534,002
FLEXIBLE CONSTRUCTION ANNUAL COST PER MILE \$61,038

MAINTENANCE COSTS:

ITEM	THICKNESS	MATERIAL	UNIT COST
ROUTINE MAINTENANCE ACTIVITY			\$0.00 LANE-MILE / YEAR
HMA OVERLAY PVMT SURF	(2.00")	Surface Mix	\$10.00 / SQ YD
HMA OVERLAY PVMT	(2.25")	Surface Mix	\$11.25 / SQ YD
HMA SURFACE MIX	(1.50")	Surface Mix	\$7.50 / SQ YD
HMA BINDER MIX	(0.75")	Leveling Binder Mix	\$3.75 / SQ YD
HMA OVERLAY SHLD (Year 30)	(2.25")	Shoulder Mix	\$11.25 / SQ YD
HMA OVERLAY SHLD	(2.00")	Shoulder Mix	\$10.00 / SQ YD
MILLING (2.00 IN)			\$2.50 / SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill Surf)		Surface Mix	\$90.83 / SQ YD
PARTIAL DEPTH SHLD PATCH (Mill & Fill Surf)		Shoulder Mix	\$89.71 / SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill +2.00")		Leveling Binder Mix	\$90.83 / SQ YD
PARTIAL DEPTH SHLD PATCH (Mill & Fill +2.00")		Shoulder Mix	\$89.71 / SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL			\$2.00 / LIN FT
CENTERLINE JOINT ROUT & SEAL			\$2.00 / LIN FT
RANDOM / THERMAL CRACK ROUT & SEAL (100% Rehab = 110.00' / Station / Lane)			\$2.00 / LIN FT

FLEXIBLE TOTAL LIFE-CYCLE COST \$782,969
FLEXIBLE TOTAL ANNUAL COST PER MILE \$89,495

FULL-DEPTH HMA PAVEMENT
HMA OVERLAY OF RUBBLIZED PCC PAVEMENT
Figure 54-7.C
STANDARD DESIGN

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST	COST	PRESENT WORTH
YEAR 5							
	LONG SHLD JT R&S	100.00%	3,768	LIN FT	\$2.00	\$7,536	
	CNTR LINE JOINT R&S	100.00%	5,652	LIN FT	\$2.00	\$11,304	
	RNDM / THRM CRACK R&S	50.00%	4,145	LIN FT	\$2.00	\$8,290	
	PD PVMT PATCH M&F SURF	0.10%	10	SQ YD	\$90.83	\$908	
	PWFn =	0.8626	PW =	0.8626	X	\$28,038	\$24,186
YEAR 10							
	LONG SHLD JT R&S	100.00%	3,768	LIN FT	\$2.00	\$7,536	
	CNTR LINE JOINT R&S	100.00%	5,652	LIN FT	\$2.00	\$11,304	
	RNDM / THRM CRACK R&S	50.00%	4,145	LIN FT	\$2.00	\$8,290	
	PD PVMT PATCH M&F SURF	0.50%	50	SQ YD	\$90.83	\$4,542	
	PWFn =	0.7441	PW =	0.7441	X	\$31,672	\$23,567
YEAR 15							
	MILL PVMT & SHLD 2.00"	100.00%	10,048	SQ YD	\$2.50	\$25,120	
	PD PVMT PATCH M&F ADD'L 2.00"	1.00%	100	SQ YD	\$90.83	\$9,083	
	HMA OVERLAY PVMT 2.00"	100.00%	10,048	SQ YD	\$10.00	\$100,480	
	HMA OVERLAY SHLD 2.00 "	100.00%	0	SQ YD	\$10.00	\$0	
	PWFn =	0.6419	PW =	0.6419	X	\$134,683	\$86,448
YEAR 20							
	LONG SHLD JT R&S	100.00%	3,768	LIN FT	\$2.00	\$7,536	
	CNTR LINE JOINT R&S	100.00%	5,652	LIN FT	\$2.00	\$11,304	
	RNDM / THRM CRACK R&S	50.00%	4,145	LIN FT	\$2.00	\$8,290	
	PD PVMT PATCH M&F SURF	0.10%	10	SQ YD	\$90.83	\$908	
	PWFn =	0.5537	PW =	0.5537	X	\$28,038	\$15,524
YEAR 25							
	LONG SHLD JT R&S	100.00%	3,768	LIN FT	\$2.00	\$7,536	
	CNTR LINE JOINT R&S	100.00%	5,652	LIN FT	\$2.00	\$11,304	
	RNDM / THRM CRACK R&S	50.00%	4,145	LIN FT	\$2.00	\$8,290	
	PD PVMT PATCH M&F SURF	0.50%	50	SQ YD	\$90.83	\$4,542	
	PWFn =	0.4776	PW =	0.4776	X	\$31,672	\$15,127
HMA SD							
YEAR 30	NON-INTERSTATE						
	MILL PVMT & SHLD 2.00"	100.00%	10,048	SQ YD	\$2.50	\$25,120	
	PD PVMT PATCH M&F ADD'L 2.00"	2.00%	201	SQ YD	\$90.83	\$18,257	
	PD SHLD PATCH M&F ADD'L 2.00"	1.00%	0	SQ YD	\$89.71	\$0	
	HMA OVERLAY PVMT 2.25 "	100.00%	10,048	SQ YD	\$11.25	\$113,040	
	HMA OVERLAY SHLD 2.25 "	100.00%	0	SQ YD	\$11.25	\$0	
	PWFn =	0.4120	PW =	0.4120	X	\$156,417	\$64,442
YEAR 35							
	LONG SHLD JT R&S	100.00%	3,768	LIN FT	\$2.00	\$7,536	
	CNTR LINE JOINT R&S	100.00%	5,652	LIN FT	\$2.00	\$11,304	
	RNDM / THRM CRACK R&S	50.00%	4,145	LIN FT	\$2.00	\$8,290	
	PD PVMT PATCH M&F SURF	0.10%	10	SQ YD	\$90.83	\$908	
	PWFn =	0.3554	PW =	0.3554	X	\$28,038	\$9,964
YEAR 40							
	LONG SHLD JT R&S	100.00%	3,768	LIN FT	\$2.00	\$7,536	
	CNTR LINE JOINT R&S	100.00%	5,652	LIN FT	\$2.00	\$11,304	
	RNDM / THRM CRACK R&S	50.00%	4,145	LIN FT	\$2.00	\$8,290	
	PD PVMT PATCH M&F SURF	0.50%	50	SQ YD	\$90.83	\$4,542	
	PWFn =	0.3066	PW =	0.3066	X	\$31,672	\$9,709
							\$248,967
ROUTINE MAINTENANCE ACTIVITY			1.43 Lane Miles	0.00	\$0	\$0	
MAINTENANCE LIFE-CYCLE COST							\$248,967
45	YEAR LIFE CYCLE	CRFn = 0.0407852	MAINTENANCE ANNUAL COST PER MILE				\$28,458

PCC PAVEMENT**JPCP**

ROUTE Rand Rd (FAU 3523)
 SECTION 120-Y-B
 COUNTY Cook
 LOCATION Elk Blvd to Ballard Rd

FACILITY TYPE NON-INTERSTATE

PROJECT LENGTH 1884 FT ==> 0.36 Miles
 # OF CENTERLINES 3 CL
 # OF LANES 4 LANES
 # OF EDGES 2 EP
 LANE WIDTH - AVERAGE 12 FT
 SHOULDER WIDTH PCC Inside 0 FT
 PCC Outside 0 FT

PAVEMENT THICKNESS (RIGID) JPCP 9.00 IN TIED SHLD
 SHOULDER THICKNESS 9.00 IN

POLICY OVERLAY THICKNESS 2.50 IN

RIGID PAVEMENT	TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
		5.02	1.56	5.02
Worksheet Construction Type is Reconstruction		The Pavement Type is		JPCP

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY UNIT	UNIT PRICE	COST
JPC PAVEMENT	(9.00")	10,048 SQ YD	\$43.47 / SQ YD	\$436,787
PAVEMENT REINFORCEMENT		0 SQ YD	\$0.00 / SQ YD	\$0
STABILIZED SUBBASE	(4.50")	0 SQ YD *	\$15.00 / SQ YD	\$0
PCC SHOULDERS	(9.00" to 9.00")	0 SQ YD	\$38.47 / SQ YD	\$0
CURB & GUTTER		0 LIN FT	\$30.00 / LIN FT	\$0
SUBBASE GRAN MATL TY C	(~ 0.00")	20 TONS *	\$25.00 / TON	\$500
IMPROVED SUBGRADE:	Aggregate (1.50" = 50.7)	10,606 SQ YD *	\$10.00 / SQ YD	\$106,060
Reserved For User Supplied Item		0 UNITS	\$0.00 / UNITS	\$0
Reserved For User Supplied Item		0 UNITS	\$0.00 / UNITS	\$0
PAVEMENT REMOVAL		10,048 SQ YD	\$0.00 / SQ YD	\$0
SHOULDER REMOVAL		0 SQ YD	\$0.00 / SQ YD	\$0

Note: * Denotes User Supplied Quantity

RIGID CONSTRUCTION INITIAL COST	\$543,347
RIGID CONSTRUCTION ANNUAL COST PER MILE	\$62,106

MAINTENANCE COSTS:

ITEM	THICKNESS	MATERIAL	UNIT COST
ROUTINE MAINTENANCE ACTIVITY \$0.00 / LANE-MILE / YEAR			
HMA POLICY OVERLAY	(2.50")	2.50	
HMA POLICY OVERLAY PVMT	(2.50")	1.0041	\$12.50 / SQ YD
HMA SURFACE MIX	(1.50")	1.0025	\$7.50 / SQ YD
HMA BINDER MIX	(1.00")	1.0055	\$5.00 / SQ YD
HMA POLICY OVERLAY SHLD	(2.50")	2.50	\$12.50 / SQ YD
CLASS A PAVEMENT PATCHING			\$170.00 / SQ YD
CLASS B PAVEMENT PATCHING			\$130.00 / SQ YD
CLASS C SHOULDER PATCHING			\$110.00 / SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA Surf)		Surface Mix 1.33	\$88.17 / SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA 2.50")		Surface Mix 2.50	\$93.49 / SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL			\$2.00 / LIN FT
CENTERLINE JOINT ROUT & SEAL			\$2.00 / LIN FT
REFLECTIVE TRANSVERSE CRACK ROUT & SEAL			\$2.00 / LIN FT
RANDOM CRACK ROUT & SEAL	(100% Rehab = 100.00' / Station / Lane)		\$2.00 / LIN FT

RIGID TOTAL LIFE-CYCLE COST	\$688,009
RIGID TOTAL ANNUAL COST PER MILE	\$78,641

MAINTENANCE AND REHABILITATION ACTIVITY SCHEDULE

11/07/13

JOINTED PLAIN CONCRETE PAVEMENT
UNBONDED JOINTED PLAIN CONCRETE OVERLAY
Figure 54-7.A

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST	COST	PRESENT WORTH
YEAR 10							
	PAVEMENT PATCH CLASS B	0.10%	10	SQ YD	\$130.00	\$1,300	
	PWFn =	0.7441		PW =	0.7441 X	\$1,300	\$967
YEAR 15							
	PAVEMENT PATCH CLASS B	0.20%	20	SQ YD	\$130.00	\$2,600	
	PWFn =	0.6419		PW =	0.6419 X	\$2,600	\$1,669
YEAR 20							
	PAVEMENT PATCH CLASS B	2.00%	201	SQ YD	\$130.00	\$26,130	
	SHOULDER PATCH CLASS C	0.50%	0	SQ YD	\$110.00	\$0	
	LONGITUDINAL SHLD JT R&S	100.00%	3,768	LIN FT	\$2.00	\$7,536	
	CENTERLINE JT R&S	100.00%	5,652	LIN FT	\$2.00	\$11,304	
	PWFn =	0.5537		PW =	0.5537 X	\$44,970	\$24,899
YEAR 25							
	PAVEMENT PATCH CLASS B	3.00%	301	SQ YD	\$130.00	\$39,130	
	SHOULDER PATCH CLASS C	1.00%	0	SQ YD	\$110.00	\$0	
	PWFn =	0.4776		PW =	0.4776 X	\$39,130	\$18,689
YEAR 30	NON-INTERSTATE						
	PAVEMENT PATCH CLASS B	4.00%	402	SQ YD	\$130.00	\$52,260	
	SHOULDER PATCH CLASS C	1.50%	0	SQ YD	\$110.00	\$0	
	HMA POLICY OVERLAY 2.5" (PVMT)	100.00%	10,048	SQ YD	\$12.50	\$125,600	
	HMA POLICY OVERLAY 2.5" (SHLD)	100.00%	0	SQ YD	\$12.50	\$0	
	PWFn =	0.4120		PW =	0.4120 X	\$177,860	\$73,276
YEAR 35	NON-INTERSTATE						
	LONGITUDINAL SHLD JT R&S	100.00%	3,768	LIN FT	\$2.00	\$7,536	
	CENTERLINE JT R&S	100.00%	5,652	LIN FT	\$2.00	\$11,304	
	RANDOM CRACK R&S	50.00%	3,768	LIN FT	\$2.00	\$7,536	
	REFLECTIVE TRANSVERSE CRACK R&S	40.00%	2,419	LIN FT	\$2.00	\$4,838	
	PD PVMT PATCH M&F HMA 2.50"	0.10%	10	SQ YD	\$93.49	\$935	
	PWFn =	0.3554		PW =	0.3554 X	\$32,149	\$11,425
YEAR 40	NON-INTERSTATE						
	PAVEMENT PATCH CLASS B	0.50%	50	SQ YD	\$130.00	\$6,500	
	LONGITUDINAL SHLD JT R&S	100.00%	3,768	LIN FT	\$2.00	\$7,536	
	CENTERLINE JT R&S	100.00%	5,652	LIN FT	\$2.00	\$11,304	
	REFLECTIVE TRANSVERSE CRACK R&S	60.00%	3,629	LIN FT	\$2.00	\$7,258	
	RANDOM CRACK R&S	50.00%	3,768	LIN FT	\$2.00	\$7,536	
	PD PVMT PATCH M&F HMA 2.50"	0.50%	50	SQ YD	\$93.49	\$4,675	
	PWFn =	0.3066		PW =	0.3066 X	\$44,809	\$13,737
							\$144,662
	ROUTINE MAINTENANCE ACTIVITY		1.43	Lane Miles	\$0.00	\$0	\$0
					MAINTENANCE LIFE-CYCLE COST		\$144,662
45	YEAR LIFE CYCLE	CRFn = 0.0407852			MAINTENANCE ANNUAL COST PER MILE		\$16,535

LIFE-CYCLE COST ANALYSIS: NEW DESIGN

Calculated / Revised : 10/22/12 10:45 AM

CONSTRUCTION	INITIAL COST	PRESENT WORTH ANNUAL COST PER MILE	JPCP	HMA
			\$543,347	\$534,002
			\$62,106	\$61,038
MAINTENANCE	LIFE-CYCLE COST	PRESENT WORTH ANNUAL COST PER MILE	\$144,662	\$248,967
			\$16,535	\$28,458
TOTAL	LIFE-CYCLE COST	PRESENT WORTH ANNUAL COST PER MILE	\$688,009	\$782,969
			\$78,641	\$89,495

LIFE-CYCLE COST ANALYSIS: FINAL SUMMARY

LOWEST COST OPTION	=====>	JPCP	\$78,641	
OTHER OPTIONS (LOWEST TO HIGHEST):	TYPE / PERCENTAGE	HMA	\$89,495	13.8%

P:\Pavement Design Stuff\ID-1\Rand Road over the Des Plaines River 10-23-12\Rand Road IDOT Mechanistic Pavement Design with LCCA 081412.xlsm]LifeCycleC

PROJECT AND TRAFFIC INPUTS

(Enter Data in Gray Shaded Cells)

Route: **Rand Rd (FAU 3523)**Comments: **Wilson Lane Reconstruction**Section: **120-Y-B****Over Des Plaines Rd**County: **Cook**

Design Date:

<-- BY

Location: **Elk Blvd to Ballard Rd**

Modify Date:

<-- BY

Facility Type: **Unmarked State Route**# of Lanes = **2 or 3**Part of future 4 lanes or more ? **No**One Way Street ? **No**Road Class: **IV**Subgrade Support Rating (SSR): **Poor**Construction Year: **2013**Design Period (DP) = **20** years

	ADT	Year
Current:	500	2010
Future:	500	2030

Structural Design Traffic				
	Minimum ADT	Actual ADT	Actual % of Total ADT	% of ADT in Design Lane
PV =	No Min	490	98.0%	P = 50%
SU =	No Min	9	1.8%	S = 50%
MU =	No Min	1	0.2%	M = 50%
Struct. Design ADT =	500		(2023)	

TRAFFIC FACTOR CALCULATION

FLEXIBLE PAVEMENT

Cpv = 0.15

Csu = **109.14**Cmu = **384.35**

TF flexible (Actual) = 0.01 (Actual ADT)

TF flexible (Min) = No Min (Min ADT Fig. 54-2.C)

RIGID PAVEMENT

Cpv = 0.15

Csu = **129.58**Cmu = **562.47**

TF rigid (Actual) = 0.02 (Actual ADT)

TF rigid (Min) = No Min (Min ADT Fig. 54-2.C)

NEW CONSTRUCTION / RECONSTRUCTION PAVEMENT DESIGN CALCULATIONS

Full-Depth HMA Pavement

Use TF flexible = 0.50 Per BDE 54-5.01(i)-1g

PG Grade Lower Binder Lifts = **PG 64-22** (Fig. 53-4.R)HMA Mixture Temp. = **74.0** deg. F (Fig. 54-5.C)Design HMA Mixture Modulus (E_{HMA}) = 720 ksi (Fig. 54-5.D)Design HMA Strain (ε_{HMA}) = 147 (Fig. 54-5.E)

Full Depth HMA Design Thickness = 7.00 in. (Fig. 54-5.F)

Limiting Strain Criterion Thickness = **14.50** in. (Fig. 54-5.I)Use Full-Depth HMA Thickness = **7.00** inches

JPC Pavement

Use TF rigid = 0.02

Edge Support = **Tied** Shoulder or C.&G.Rigid Pavt Thick. = **999.00** in. (Fig. 54-4.E)**** USE FIG. 54-4.H AND 54-4.I ****

CRC Pavement

Use TF rigid = 0.02

IBR value = **3**CRCP Thickness = **999.00** in. (Fig. 54-4.N)**TF MUST BE > 60 FOR CRCP**

RECONSTRUCTION ONLY (SUPPLEMENTAL) PAVEMENT DESIGN CALCULATIONS

HMA Overlay of Rubblized PCC

Use TF flexible = 0.50

District = **3,4,5,6**HMA Overlay Design Thickness = **5.25** in. (Fig. 54-5.U)

Unbonded Concrete Overlay

Review 54-4.03 for limitations and special considerations.

JPCP Thickness = **NA** inches**CONTACT BMPP FOR ASSISTANCE**

DESIGN TABLES FROM BDE MANUAL CHAPTER 54 - PAVEMENT DESIGN

Class I Roads	Class II Roads	Class III Roads	Class IV Roads
4 lanes or more	2 lanes with ADT > 2000	2 Lanes	2 Lanes
Part of a future 4 lanes or more	One way Street with ADT <= 3500	(ADT 750 -2000)	(ADT < 750)
One-way Streets with ADT > 3500			

Facility Type	Min. Str. Design Traffic (Fig 54-2.C)		
	PV	SU	MU
Interstate or Supplemental Freeway	0	500	1500
Other Marked State Route	0	250	750
Unmarked State Route	No Min	No Min	No Min

Class Table for One-Way Streets	
ADT	Class
0 - 3500	II
>3501	I

Class	Traffic Factor ESAL Coefficients			
	Rigid (Fig. 54-4.C)		Flexible (Fig. 54-5.B)	
	Csu	Cmu	Csu	Cmu
I	143.81	696.42	132.50	482.53
II	135.78	567.21	112.06	385.44
III	129.58	562.47	109.14	384.35
IV	129.58	562.47	109.14	384.35

Class Table for 2 or 3 lanes (not future 4 lane & not one-way street)	
ADT	Class
0 - 749	IV
750 - 2000	III
>2000	II

Design Lane Distribution Factors For Structural Design Traffic (Fig. 54-2.B)						
Number of Lanes	Rural			Urban		
	P	S	M	P	S	M
1 Lane Ramp	100%	100%	100%	100%	100%	100%
2 or 3	50%	50%	50%	50%	50%	50%
4	32%	45%	45%	32%	45%	45%
6 or more	20%	40%	40%	8%	37%	37%

LIFE-CYCLE COST ANALYSIS: NEW CONSTRUCTION / RECONSTRUCTION**FULL-DEPTH HMA PAVEMENT**

Standard Design

ROUTE Rand Rd (FAU 3523)
 SECTION 120-Y-B
 COUNTY Cook
 LOCATION Elk Blvd to Ballard Rd

FACILITY TYPE NON-INTERSTATE

PROJECT LENGTH 430 FT ==> 0.08 Miles
 # OF CENTERLINES 1 CL
 # OF LANES 2 LANES
 # OF EDGES 2 EP
 LANE WIDTH - AVERAGE 12 FT
 SHOULDER WIDTH HMA Inside 0 FT
 HMA Outside 0 FT

PAVEMENT THICKNESS (FLEXIBLE) 7.00 IN 14.50 IN MAX
 SHOULDER THICKNESS 8.00 IN
 POLICY OVERLAY THICKNESS 2.25 IN

FLEX PAVEMENT	TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
		No Min	0.01	No Min

Read Me!

HMA	COST PER TON	UNIT PRICE
HMA SURFACE		\$95.00 / TON
HMA TOP BINDER		\$90.00 / TON
HMA LOWER BINDER		\$85.00 / TON
HMA BINDER (LEVELING)		\$95.00 / TON
HMA SHOULDER		\$85.00 / TON

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT	UNIT PRICE	COST
HMA PAVEMENT (FULL-DEPTH)	(7.00")	1,147	SQ YD	\$33.26 / SQ YD	\$38,138 ~
HMA SURFACE COURSE	(2.00")	1,147	SQ YD	\$13.50 / SQ YD	\$0
HMA TOP BINDER COURSE	(2.25")	1,147	SQ YD	\$0.00 / SQ YD	\$0
HMA LOWER BINDER COURSE	(2.75")	1,147	SQ YD	\$19.76 / SQ YD	\$0
HMA SHOULDER	(8.00")	0	TONS	\$85.00 / TON	\$0 ~
CURB & GUTTER		0	LIN FT	\$30.00 / LIN FT	\$0
SUBBASE GRAN MATL TY C (TONS)		0	TONS	\$25.00 / TON	\$0
IMPROVED SUBGRADE: Aggregate		1,250	SQ YD	\$10.00 / SQ YD	\$12,500
Reserved For User Supplied Item		0	UNITS	\$0.00 / UNITS	\$0
Reserved For User Supplied Item		0	UNITS	\$0.00 / UNITS	\$0
PAVEMENT REMOVAL		1,147	SQ YD	\$0.00 / SQ YD	\$0
SHOULDER REMOVAL		0	SQ YD	\$0.00 / SQ YD	\$0

Note: * Denotes User Supplied Quantity

FLEXIBLE CONSTRUCTION INITIAL COST \$50,638
 FLEXIBLE CONSTRUCTION ANNUAL COST PER MILE \$25,360

MAINTENANCE COSTS:

ITEM	THICKNESS	MATERIAL	UNIT COST
ROUTINE MAINTENANCE ACTIVITY \$0.00 LANE-MILE / YEAR			
HMA OVERLAY PVMT SURF	(2.00")	Surface Mix	\$10.00 / SQ YD
HMA OVERLAY PVMT	(2.25")	Surface Mix	\$11.25 / SQ YD
HMA SURFACE MIX	(1.50")	Surface Mix	\$7.50 / SQ YD
HMA BINDER MIX	(0.75")	Leveling Binder Mix	\$3.75 / SQ YD
HMA OVERLAY SHLD (Year 30)	(2.25")	Shoulder Mix	\$11.25 / SQ YD
HMA OVERLAY SHLD	(2.00")	Shoulder Mix	\$10.00 / SQ YD
MILLING (2.00 IN)			\$2.50 / SQ YD
PARTIAL DEPTH PVMT PATCH	(Mill & Fill Surf)	Surface Mix	\$90.83 / SQ YD
PARTIAL DEPTH SHLD PATCH	(Mill & Fill Surf)	Shoulder Mix	\$89.71 / SQ YD
PARTIAL DEPTH PVMT PATCH	(Mill & Fill +2.00")	Leveling Binder Mix	\$90.83 / SQ YD
PARTIAL DEPTH SHLD PATCH	(Mill & Fill +2.00")	Shoulder Mix	\$89.71 / SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL			\$2.00 / LIN FT
CENTERLINE JOINT ROUT & SEAL			\$2.00 / LIN FT
RANDOM / THERMAL CRACK ROUT & SEAL	(100% Rehab = 110.00' / Station / Lane)		\$2.00 / LIN FT

FLEXIBLE TOTAL LIFE-CYCLE COST \$80,466
 FLEXIBLE TOTAL ANNUAL COST PER MILE \$40,298

FULL-DEPTH HMA PAVEMENT
HMA OVERLAY OF RUBBLIZED PCC PAVEMENT
Figure 54-7.C
STANDARD DESIGN

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST	COST	PRESENT WORTH
YEAR 5							
	LONG SHLD JT R&S	100.00%	860	LIN FT	\$2.00	\$1,720	
	CNTR LINE JOINT R&S	100.00%	430	LIN FT	\$2.00	\$860	
	RNDM / THRM CRACK R&S	50.00%	473	LIN FT	\$2.00	\$946	
	PD PVMT PATCH M&F SURF	0.10%	1	SQ YD	\$90.83	\$91	
	PWFn =	0.8626		PW =	0.8626 X	\$3,617	\$3,120
YEAR 10							
	LONG SHLD JT R&S	100.00%	860	LIN FT	\$2.00	\$1,720	
	CNTR LINE JOINT R&S	100.00%	430	LIN FT	\$2.00	\$860	
	RNDM / THRM CRACK R&S	50.00%	473	LIN FT	\$2.00	\$946	
	PD PVMT PATCH M&F SURF	0.50%	6	SQ YD	\$90.83	\$545	
	PWFn =	0.7441		PW =	0.7441 X	\$4,071	\$3,029
YEAR 15							
	MILL PVMT & SHLD 2.00"	100.00%	1,147	SQ YD	\$2.50	\$2,868	
	PD PVMT PATCH M&F ADD'L 2.00"	1.00%	11	SQ YD	\$90.83	\$999	
	HMA OVERLAY PVMT 2.00"	100.00%	1,147	SQ YD	\$10.00	\$11,467	
	HMA OVERLAY SHLD 2.00 "	100.00%	0	SQ YD	\$10.00	\$0	
	PWFn =	0.6419		PW =	0.6419 X	\$15,334	\$9,842
YEAR 20							
	LONG SHLD JT R&S	100.00%	860	LIN FT	\$2.00	\$1,720	
	CNTR LINE JOINT R&S	100.00%	430	LIN FT	\$2.00	\$860	
	RNDM / THRM CRACK R&S	50.00%	473	LIN FT	\$2.00	\$946	
	PD PVMT PATCH M&F SURF	0.10%	1	SQ YD	\$90.83	\$91	
	PWFn =	0.5537		PW =	0.5537 X	\$3,617	\$2,003
YEAR 25							
	LONG SHLD JT R&S	100.00%	860	LIN FT	\$2.00	\$1,720	
	CNTR LINE JOINT R&S	100.00%	430	LIN FT	\$2.00	\$860	
	RNDM / THRM CRACK R&S	50.00%	473	LIN FT	\$2.00	\$946	
	PD PVMT PATCH M&F SURF	0.50%	6	SQ YD	\$90.83	\$545	
	PWFn =	0.4776		PW =	0.4776 X	\$4,071	\$1,944
HMA_SD							
YEAR 30 NON-INTERSTATE							
	MILL PVMT & SHLD 2.00"	100.00%	1,147	SQ YD	\$2.50	\$2,868	
	PD PVMT PATCH M&F ADD'L 2.00"	2.00%	23	SQ YD	\$90.83	\$2,089	
	PD SHLD PATCH M&F ADD'L 2.00"	1.00%	0	SQ YD	\$89.71	\$0	
	HMA OVERLAY PVMT 2.25 "	100.00%	1,147	SQ YD	\$11.25	\$12,900	
	HMA OVERLAY SHLD 2.25 "	100.00%	0	SQ YD	\$11.25	\$0	
	PWFn =	0.4120		PW =	0.4120 X	\$17,857	\$7,357
YEAR 35							
	LONG SHLD JT R&S	100.00%	860	LIN FT	\$2.00	\$1,720	
	CNTR LINE JOINT R&S	100.00%	430	LIN FT	\$2.00	\$860	
	RNDM / THRM CRACK R&S	50.00%	473	LIN FT	\$2.00	\$946	
	PD PVMT PATCH M&F SURF	0.10%	1	SQ YD	\$90.83	\$91	
	PWFn =	0.3554		PW =	0.3554 X	\$3,617	\$1,285
YEAR 40							
	LONG SHLD JT R&S	100.00%	860	LIN FT	\$2.00	\$1,720	
	CNTR LINE JOINT R&S	100.00%	430	LIN FT	\$2.00	\$860	
	RNDM / THRM CRACK R&S	50.00%	473	LIN FT	\$2.00	\$946	
	PD PVMT PATCH M&F SURF	0.50%	6	SQ YD	\$90.83	\$545	
	PWFn =	0.3066		PW =	0.3066 X	\$4,071	\$1,248
							\$29,828
ROUTINE MAINTENANCE ACTIVITY			0.16 Lane Miles		0.00	\$0	\$0
							MAINTENANCE LIFE-CYCLE COST \$29,828
45 YEAR LIFE CYCLE			CRFn = 0.0407852				MAINTENANCE ANNUAL COST PER MILE \$14,938

PCC PAVEMENT**JPCP**

ROUTE
SECTION
COUNTY
LOCATION

Rand Rd (FAU 3523)
120-Y-B
Cook
Elk Blvd to Ballard Rd

FACILITY TYPE

NON-INTERSTATE

PROJECT LENGTH 430 FT ==> 0.08 Miles
OF CENTERLINES 1 CL
OF LANES 2 LANES
OF EDGES 2 EP
LANE WIDTH - AVERAGE 12 FT
SHOULDER WIDTH PCC Inside 0 FT
PCC Outside 0 FT

PAVEMENT THICKNESS (RIGID) JPCP 6.50 IN TIED SHLD
SHOULDER THICKNESS 6.50 IN

POLICY OVERLAY THICKNESS 2.50 IN

RIGID PAVEMENT	TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
Worksheet Construction Type is	Reconstruction	No Min	0.02	No Min
		User Override Pavement Type is		JPCP

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT	UNIT PRICE	COST
JPC PAVEMENT	(6.50")	1,147	SQ YD	\$41.27 / SQ YD	\$47,337
PAVEMENT REINFORCEMENT		0	SQ YD	\$0.00 / SQ YD	\$0
STABILIZED SUBBASE	(4.50")	0	SQ YD	\$15.00 / SQ YD	\$0
PCC SHOULDERS	(6.50" to 6.50")	0	SQ YD	\$36.27 / SQ YD	\$0
CURB & GUTTER		0	LIN FT	\$30.00 / LIN FT	\$0
SUBBASE GRAN MATL TY C	(~ 0.00")	0	TONS	\$25.00 / TON	\$0
IMPROVED SUBGRADE:	Aggregate 28.2	1,250	SQ YD	\$10.00 / SQ YD	\$12,500
Reserved For User Supplied Item		0	UNITS	\$0.00 / UNITS	\$0
Reserved For User Supplied Item		0	UNITS	\$0.00 / UNITS	\$0
PAVEMENT REMOVAL		1,147	SQ YD	\$0.00 / SQ YD	\$0
SHOULDER REMOVAL		0	SQ YD	\$0.00 / SQ YD	\$0

Note: * Denotes User Supplied Quantity

RIGID CONSTRUCTION INITIAL COST \$59,837
RIGID CONSTRUCTION ANNUAL COST PER MILE \$29,967

MAINTENANCE COSTS:

ITEM	THICKNESS	MATERIAL	T	UNIT COST
ROUTINE MAINTENANCE ACTIVITY				\$0.00 / LANE-MILE / YEAR
HMA POLICY OVERLAY	(2.50")		2.35	
HMA POLICY OVERLAY PVMT	(2.50")	1.0041	2.35	\$12.50 / SQ YD
HMA SURFACE MIX	(1.50")	1.0052	1.50	\$7.50 / SQ YD
HMA BINDER MIX	(1.00")	1.0136	1.00	\$5.00 / SQ YD
HMA POLICY OVERLAY SHLD	(2.50")		2.35	\$12.50 / SQ YD
CLASS A PAVEMENT PATCHING				\$170.00 / SQ YD
CLASS B PAVEMENT PATCHING				\$130.00 / SQ YD
CLASS C SHOULDER PATCHING				\$110.00 / SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA Surf)		Surface Mix	1.80	\$88.17 / SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA 2.50")		Surface Mix	2.35	\$93.49 / SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL				\$2.00 / LIN FT
CENTERLINE JOINT ROUT & SEAL				\$2.00 / LIN FT
REFLECTIVE TRANSVERSE CRACK ROUT & SEAL				\$2.00 / LIN FT
RANDOM CRACK ROUT & SEAL	(100% Rehab = 100.00' / Station / Lane)			\$2.00 / LIN FT

RIGID TOTAL LIFE-CYCLE COST \$76,840
RIGID TOTAL ANNUAL COST PER MILE \$38,482

JOINTED PLAIN CONCRETE PAVEMENT
UNBONDED JOINTED PLAIN CONCRETE OVERLAY
Figure 54-7.A

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST	COST	PRESENT WORTH
YEAR 10							
	PAVEMENT PATCH CLASS B	0.10%	1	SQ YD	\$130.00	\$130	
	PWFn =	0.7441		PW =	0.7441 X	\$130	\$97
YEAR 15							
	PAVEMENT PATCH CLASS B	0.20%	2	SQ YD	\$130.00	\$260	
	PWFn =	0.6419		PW =	0.6419 X	\$260	\$167
YEAR 20							
	PAVEMENT PATCH CLASS B	2.00%	23	SQ YD	\$130.00	\$2,990	
	SHOULDER PATCH CLASS C	0.50%	0	SQ YD	\$110.00	\$0	
	LONGITUDINAL SHLD JT R&S	100.00%	860	LIN FT	\$2.00	\$1,720	
	CENTERLINE JT R&S	100.00%	430	LIN FT	\$2.00	\$860	
	PWFn =	0.5537		PW =	0.5537 X	\$5,570	\$3,084
YEAR 25							
	PAVEMENT PATCH CLASS B	3.00%	34	SQ YD	\$130.00	\$4,420	
	SHOULDER PATCH CLASS C	1.00%	0	SQ YD	\$110.00	\$0	
	PWFn =	0.4776		PW =	0.4776 X	\$4,420	\$2,111
YEAR 30	NON-INTERSTATE						
	PAVEMENT PATCH CLASS B	4.00%	46	SQ YD	\$130.00	\$5,980	
	SHOULDER PATCH CLASS C	1.50%	0	SQ YD	\$110.00	\$0	
	HMA POLICY OVERLAY 2.5" (PVMT)	100.00%	1,147	SQ YD	\$12.50	\$14,333	
	HMA POLICY OVERLAY 2.5" (SHLD)	100.00%	0	SQ YD	\$12.50	\$0	
	PWFn =	0.4120		PW =	0.4120 X	\$20,313	\$8,369
YEAR 35	NON-INTERSTATE						
	LONGITUDINAL SHLD JT R&S	100.00%	860	LIN FT	\$2.00	\$1,720	
	CENTERLINE JT R&S	100.00%	430	LIN FT	\$2.00	\$860	
	RANDOM CRACK R&S	50.00%	430	LIN FT	\$2.00	\$860	
	REFLECTIVE TRANSVERSE CRACK R&S	40.00%	278	LIN FT	\$2.00	\$556	
	PD PVMT PATCH M&F HMA 2.50"	0.10%	1	SQ YD	\$93.49	\$93	
	PWFn =	0.3554		PW =	0.3554 X	\$4,089	\$1,453
YEAR 40	NON-INTERSTATE						
	PAVEMENT PATCH CLASS B	0.50%	6	SQ YD	\$130.00	\$780	
	LONGITUDINAL SHLD JT R&S	100.00%	860	LIN FT	\$2.00	\$1,720	
	CENTERLINE JT R&S	100.00%	430	LIN FT	\$2.00	\$860	
	REFLECTIVE TRANSVERSE CRACK R&S	60.00%	418	LIN FT	\$2.00	\$836	
	RANDOM CRACK R&S	50.00%	430	LIN FT	\$2.00	\$860	
	PD PVMT PATCH M&F HMA 2.50"	0.50%	6	SQ YD	\$93.49	\$561	
	PWFn =	0.3066		PW =	0.3066 X	\$5,617	\$1,722
							\$17,003
	ROUTINE MAINTENANCE ACTIVITY		0.16	Lane Miles	\$0.00	\$0	\$0
							MAINTENANCE LIFE-CYCLE COST \$17,003
45	YEAR LIFE CYCLE	CRFn = 0.0407852					MAINTENANCE ANNUAL COST PER MILE \$8,515

LIFE-CYCLE COST ANALYSIS: NEW DESIGN

Calculated / Revised : 10/22/12 11:01 AM

CONSTRUCTION	INITIAL COST	PRESENT WORTH ANNUAL COST PER MILE	JPCP	HMA
			\$59,837 \$29,967	\$50,638 \$25,360
MAINTENANCE	LIFE-CYCLE COST	PRESENT WORTH ANNUAL COST PER MILE	\$17,003 \$8,515	\$29,828 \$14,938
TOTAL	LIFE-CYCLE COST	PRESENT WORTH ANNUAL COST PER MILE	\$76,840 \$38,482	\$80,466 \$40,298

LIFE-CYCLE COST ANALYSIS: FINAL SUMMARY

LOWEST COST OPTION	=====>	JPCP	\$38,482	
OTHER OPTIONS (LOWEST TO HIGHEST):	TYPE / PERCENTAGE	HMA	\$40,298	4.7%